

WHAT IS CLAIMED IS:

1. A thin-film forming apparatus comprising:

a reaction chamber for forming a thin film on a workpiece placed on a susceptor provided in the reaction chamber, said susceptor being provided with a heater for heating the workpiece, said reaction chamber being provided with a conveyer for loading and unloading the workpiece into and from the reaction chamber; and

a cleaning device for cleaning unwanted deposits adhering to the inside of the reaction chamber at predetermined intervals, said cleaning device comprising:

(i) a cleaning gas controller for introducing a cleaning gas into the reaction chamber and evacuating the reaction chamber after the cleaning treatment;

(ii) a cleaning gas activator for activating the cleaning gas in radical form; and

(iii) a temperature and timing controller programmed to reduce the temperature of the susceptor at a predetermined rate for cleaning after completion of film formation and then to actuate the cleaning gas controller and the cleaning gas activator.

2. The apparatus according to Claim 1, wherein the temperature of the susceptor for cleaning is 500°C or less.

3. The apparatus according to Claim 1, wherein the temperature of the susceptor of cleaning is 470°C or less.

4. The apparatus according to Claim 1, wherein the temperature of the susceptor for film formation is higher than 500°C.

5. The apparatus according to Claim 1, wherein the cleaning gas includes fluorine, and the activated cleaning gas includes fluorine radicals.

6. The apparatus according to Claim 1, wherein the cleaning gas activator generates a plasma discharge region for activating the cleaning gas in the reaction chamber.

7. The apparatus according to Claim 1, wherein the cleaning gas activator comprises a remote plasma discharge chamber for activating the cleaning gas prior to introduction of the cleaning gas into the reaction chamber, said remote plasma discharge chamber being disposed separately from the reaction chamber.

5 8. The apparatus according to Claim 1, wherein the unwanted deposits include at least one of silicon nitride, silicon oxide, SiOF, SiC, SiON, or hydrocarbon.

9. The apparatus according to Claim 1, which is a plasma CVD apparatus or a thermal CVD apparatus.

10 10. The apparatus according to Claim 1, wherein the cleaning gas controller introduces the cleaning gas through a showerhead disposed above the susceptor in the reaction chamber.

11. A method for cleaning unwanted deposits adhering to the inside of a reaction chamber for forming a thin film on a workpiece placed on a susceptor provided in the reaction chamber, said susceptor being provided with a heater for heating the workpiece, said reaction chamber being provided with a conveyer for loading and unloading the workpiece into and from the reaction chamber, said method comprising:

15 reducing the temperature of the susceptor at a predetermined rate for cleaning after completion of film formation;  
contacting the inside of the reaction chamber with an activated cleaning gas; and  
20 cleaning the unwanted deposits by the activated cleaning gas.

12. The method according to Claim 11, wherein the cleaning is conducted at a temperature of the susceptor of 500°C or less.

25 13. The method according to Claim 11, wherein the cleaning is conducted at a temperature of the susceptor of 470°C or less.

14. The method according to Claim 11, wherein the temperature of the susceptor is reduced from a temperature higher than 500°C upon completion of the film formation.

30 15. The method according to Claim 11, wherein the cleaning gas includes fluorine, and the activated cleaning gas includes fluorine radicals.

16. The method according to Claim 11, wherein the cleaning gas is activated in a plasma discharge region generated in the reaction chamber.

17. The method according to Claim 11, wherein the cleaning gas is activated in a remote plasma discharge chamber prior to introduction of the cleaning gas into the reaction chamber, said remote plasma discharge chamber being disposed separately from the reaction chamber.

18. The method according to Claim 11, wherein the unwanted deposits include at least one of silicon nitride, silicon oxide, SiOF, SiC, SiON, or hydrocarbon.

19. The method according to Claim 11, wherein the reaction chamber is for plasma CVD or thermal CVD.

20. The method according to Claim 11, wherein the cleaning gas is introduced through a showerhead disposed above the susceptor in the reaction chamber.

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